

Teachers on the Estuary (TOTE)

Course Syllabus

Narragansett Bay Research Reserve ~ July 28-30, 2009

Course description: This course is a pilot for the Teachers on the Estuary program, a research and field-based teacher training initiative of the National Estuarine Research Reserve System, part of the National Oceanic and Atmospheric Administration (NOAA). The goal of TOTE is to improve teachers' and students' understanding of the environment using local examples and to provide resources and experience to support the incorporation of estuary and watershed topics into classroom teaching. The course is also designed to promote stewardship of watersheds and estuaries.

The course will introduce teachers to information, research, and classroom activities about watersheds, estuaries, and coastal systems. The course incorporates investigations in the field and using on-line data. Course content and activities will be aligned with Massachusetts state science and math frameworks.

Credit: 24 hours of contact time for 2 graduate credits or 1 Professional Development Credit through the Rhode Island Department of Education. Graduate credit is optional and is available from Framingham State College for \$65.00 per credit. Professional Development Credits are free and granted through Narragansett Bay Research Reserve.

Grade levels: The course is designed for science and math teachers in grades 9 through 12. Others are welcome to apply.

Schedule:	Tuesday July 28, 2009	8:30 am – 4:30 pm & 7– 8:30 pm
<i>(Subject to change)</i>	Wednesday, July 29, 2009	9:00 am – 5:00 pm
	Thursday, July 30, 2009	10:00 am – 4:30 pm
	Saturday, October 24, 2009	9:00 am – 12:00 pm

Location: URI Coastal Institute in Narragansett, and day trip to Prudence Island, RI

Cost: Thanks to support from a NOAA Bay Watershed Education and Training grant, the course is offered without charge.

Support: Each participant will receive a \$200 mini-grant for education and stewardship projects related to course topics, \$150 in teaching materials, and a \$100 stipend upon successful completion of the course requirements.

Lodging and meals: Optional lodging at a local hotel for 3 nights will be provided for participants during the course. Meals will be provided.

Application: Space is limited and participation is by application. Applications may be downloaded at www.nbnerr.org or www.estuaries.gov

Instructor: Kristin Van Wagner, Narragansett Bay National Estuarine Research Reserve
55 South Reserve Drive, Box 151, Prudence Island, RI 02872
Kristin@nbnerr.org (401)-683-1478

Course objectives: Participants will be able to;

1. Access and use the on-line Estuaries 101 curriculum and other NERRS/NOAA educational products with students.
2. Describe major physical, biological, chemical and geochemical estuarine processes as well as impacts of human activities on coastal systems.
3. Locate, download, and use data relevant to lessons about estuaries.
4. Teach basic estuarine concepts by guiding students in using field and laboratory research techniques analogous to those used at Research Reserves.
5. Explain the six Estuarine Principles and Concepts listed below.
6. Lead students in learning activities that improve the students' abilities to become stewards of the environment.

Estuarine Principles and Concepts

Principle 1. Estuaries are interconnected with the world's oceans and with major systems and cycles on Earth.

Principle 2. Estuaries are dynamic ecosystems with tremendous variability within and between them in physical, chemical, and biological components.

Principle 3. Estuaries support an abundance of life, and a diversity of habitat types.

Principle 4. Ongoing research and monitoring is needed to increase our understanding of estuaries and to improve our ability to protect and sustain them.

Principle 5. Humans, even those living far from the coast, rely on goods and services supplied by estuaries

Principle 6. Human activities can impact estuaries by degrading water quality or altering habitats; therefore, we are responsible for making decisions to protect and maintain the health of estuaries.

Course expectations: Participants will be expected to:

1. Review pre-course materials.
2. Attend all components of the three-day session plus the follow up session.
3. Complete a pretest and post test.
4. Complete in-class and homework assignments
5. Participate in activities and discussions
6. Develop or adapt a lesson plan based on a standard format and submit by October 24, 2009.
7. Undertake a stewardship project with their students.

Course Outline: NBNERR 2009 Teachers on the Estuary (TOTE), July 28-30, 2009

Monday 7/27/09
Coastal Institute

- Afternoon Teachers arrive and check in to lodging
- 2:00 – 4:00 pm Optional training: Introduction to Excel for Teachers
- Dinner on your own
- 7:00 – 8:30 pm Optional training: Google Earth in the Classroom

Tuesday 7/28/09 *8:30 am – 4:30 pm (7 hours plus 1.5 hr evening activity) 8.5 hours*
Coastal Institute

- 7:30 am Breakfast
- 8:30 am Welcome, introductions, pre-test, overview of course
- 9:00 am Introduction to NERRS, estuaries and watersheds
Estuary and watershed background
NERRS mission, methods, issues, research projects
Estuary Education Principles & Concepts
- 10:15 am Break
- 10:30 am Estuaries101 Curriculum Overview
Investigating estuaries with E101
E101 Lessons and Activities (computer-based) biological studies
- Noon Lunch
- 1:00 pm **Meet a Scientist:** Mike Bradley (invited) will present information about his work to map eelgrass in Narragansett Bay and using this aquatic plant as a biological indicator of water quality in the Bay.
- 2:00 pm E101 Lessons and Activities (computer-based)
Biological studies
- 3:00 pm Break
- 3:15 pm Sampling and observation at the shore
- 4:30 pm Finish activities
- 6:00 pm Dinner as a group

7:00 – 8:30 pm **Meet a Scientist:** Nicole Rohr (invited) will explain her research on Asian Shore Crabs followed by hands-on crab monitoring activity.
Low Tide is at 7:54 pm.

Wednesday 7/29/09
Coastal Institute

9 am to 5:00 pm 7 hours

8:00 am	Breakfast
9:00 am	Review content and answer questions from Day 1
9:30 am	E101 Lessons and Activities Estuary studies in physical and earth science
10:15 am	Break
10:30 am	E101 Lessons and Activities Estuary studies in physical and earth science
11: 30 am	Sampling and observations around the building
Noon	Lunch
1:00 pm	Meet a Scientist: Dr. Chris Melrose, NOAA NMFS will present on his research studying water quality in the Bay with a focus on hypoxia issues and his method of mid-water water quality sampling
2:00 pm	E101 Lessons and Activities Estuary studies in physical and earth science
3:15 pm	Break
3:30 pm	Making it Practical: Presentation by teachers on using estuaries in the curriculum; subject area discussions on incorporating estuary concepts; materials, equipment, data management, ongoing support and resources from the Reserves.
5:00 pm	Finish activities
6:00 pm	Dinner

Thursday 7/30/09

10:00 am to 4:30 pm

5.5 hours

Prudence Island

- 8:00 am Breakfast at hotel
- 9:00 am Leave the hotel for Bristol in NBNERR van(s)
- 10:00 am Ferry to Prudence
- 10:45 am Island Tour and Field Activities
Meet a Scientist: Dr. Kenny Raposa, Research Coordinator to demonstrate nekton sampling techniques and provide an overview of salt marsh ecology and sentinel site monitoring for impacts of climate change such as sea level rise
- Noon Lunch
- 12:30 pm Island Tour and Field Activities
NBNERR Headquarters, T-Wharf, SWMP Station, Ed Shed
- 3:00 pm Location TBD - Post-test and Evaluation
- 4:00 pm Leave on ferry back to Bristol
- 4:30 pm Workshop ends and van(s) leave to return to the hotel as needed

Follow up class, October 24, 2009

9:00 am – Noon

3 hours

Presentations by teachers on using estuary lessons with classes

Course texts and materials: Readings and reference materials will be drawn from the following sources, as well as from NOAA and many other web sites. In addition, many lesson plans and curriculum materials for teaching about estuaries will be provided.

Bradley, M., Raposa, K., Tuxbury, S. 2007. Report on the Analysis of True Color Aerial Photography to Map and Inventory *Zostera marina* L. in Narragansett Bay and Block Island, Rhode Island.

Desbonnet, A. and Costa-Pierce, B. (Editors) 2008. Science of Ecosystem-based Management: Narragansett Bay in the 21st Century, Springer Series on Environmental Management. Springer Press.

Doherty, A.M. 1995. Historical Distributions of Eelgrass (*Zostera marina*) in Narragansett Bay, Rhode Island 1850-1995. Narragansett Bay Estuary Program.

Estuaries 101 <http://www.estuaries.gov/estuaries101/Teachers/Home.aspx>

Intergovernmental Panel on Climate Change. 2007. Fourth Assessment Report: Climate Change 2007. UNEP.

Lambert, K.F. 2005. Nitrogen Pollution: From the Sources to the Sea. Hubbard Brook Research Foundation

Northeast Fisheries Science Center. 2007. Ecology of the Northeast Continental Shelf.

Pryor, D., Saarman, E., Murray, D., and Prell, W. 2007. Nitrogen Loading from Wastewater Treatment Plants to Upper Narragansett Bay. Narragansett Bay Estuary Program.

Raposa, K. and Schwartz, M. Draft. An Ecological Profile of the Narragansett Bay National Estuarine Research Reserve. RI Sea Grant.

Tiner, R.W., Nuerminger, T., and Mandeville, A. 2004. Coastal Wetlands Trends in Narragansett Bay Estuary During the 20th Century. Narragansett Bay Estuary Program.

US Global Change Research Program. 2001 New England Regional Assessment.

Course requirements: Participants will be required to complete several exercises using Google Earth and Excel during the course: Support, guidance, and plenty of TLC will be provided before and during the course. Exercises will include

1. Google Earth watershed investigation
2. Entering data and creating Excel spreadsheets and graphs
3. Retrieval and construction of graphs using System Wide Monitoring Program data from Central Data Management Office web site
4. Retrieval and construction of graphs of NOAA data including: tides from NOAA's Tides Online, buoy data from National Data Buoy Center, and weather data from National Weather Service.

There are two major assignments for the course. One is for teachers to develop a **lesson** for teaching estuary and watershed content for their own classes. The lesson should be based on material presented in the course. The lesson does not have to be original. Teachers can choose to modify an E101 lesson or another existing lesson for use with their classes. The goal is for teachers to develop a lesson that they will use. Teachers will present a summary of one of their lessons on the course follow up day, October 24, 2009 .

The lesson plan should include sections based on the following format:

- Title
- Grade level
- Main concepts
- Relevant science or math standards
- Materials and equipment
- Background information
- An outline of the lesson
- Tips and hints for other teachers
- Your sources of information

The second requirement is for teachers to complete a **stewardship project** with their students. Stewardship projects should have components that will benefit their local watershed. Examples of stewardship projects include adopting a water body near the school by making a commitment for monitoring and/or cleanup, making a presentation to the community, recruiting community volunteers for a service project, starting a sustainable practice (such as recycling, or replacing incandescent light bulbs with compact fluorescent bulbs) in their school, and teaching others in the community what they have learned. Participants will submit a summary and review of their students' stewardship project at the follow up meeting (and samples or photos of student work if appropriate), or an overview if the project is in the planning stage, with a summary to follow after project activities have taken place.

Stewardship projects should:

- Address a resource management need in the students' own watershed.
- Be student driven.
- Include outreach to a broader community (beyond their own class).
- Utilize knowledge or practice skills learned through TOTE training.
- Be an integral part of the instructional program.
- Collaboration with a community organization or volunteer expert in the community is a plus.

Teachers may work alone or with one or two other participants to develop and carry out the stewardship project and the lesson. The completed lesson and report or plan for a project will be due on the follow-up day, Saturday October 24, 2009. Lessons should be sent to Kristin Van Wagner via e-mail at kristin@nbnerr.org.

Grading criteria:

Participants earning graduate credit and those earning Professional Development Credits must complete exercises assigned as part of class work. The computer-based activities completed during the course will be worth 20 percent of the grade, participation and contributions to discussions will be worth 20 percent, the lesson plan will be worth 30 percent and the stewardship project will be worth 30 percent.

Sample lesson plans will be provided as guides to the content and extent of the required lesson plans. Participants taking the course for Professional Development Credits but not for graduate credit will not be graded, but should complete the lesson plan by the follow-up date in October 2009 and should plan to implement a stewardship project.